

# Report 5

16-3

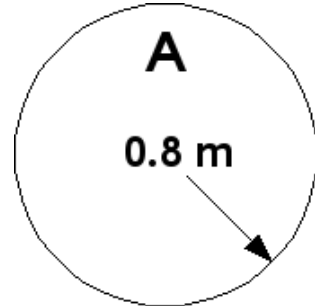
$$\omega = 2t^2 + 2$$

$$\alpha = 4t$$

When  $t = 0.5$  seconds:

$$\text{Velocity: } \omega = 2(0.5)^2 + 2 = 2.5 \text{ rad/s}$$

$$\text{Acceleration: } \alpha = 4(0.5) = 2 \text{ rad/s}^2$$



16-11

$$\omega_0 = 8 \text{ rad/s}$$

$$\alpha_A = 6 \text{ rad/s}^2$$

$$r_A = 2 \text{ m}$$

$$r_B = 1.5 \text{ m}$$

$$1.5\alpha_B = 6 \times 2$$

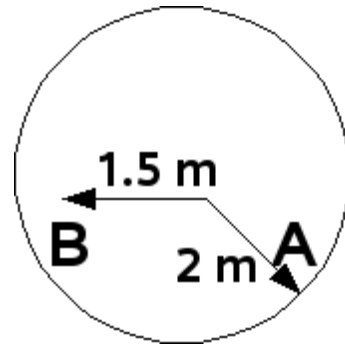
$$\alpha_B = 8$$

For 2 revolutions:

$$\theta = 4\pi$$

$$4\pi = 8 + 3t^2$$

$$t = \sqrt{(4\pi - 8)/3} = 1.234 \text{ seconds}$$



16-13

$$r = 0.15 \text{ m}$$

$$\alpha_A = (0.6t^2 - 0.75)$$

$$\omega_0 = 6 \text{ rad/s}$$

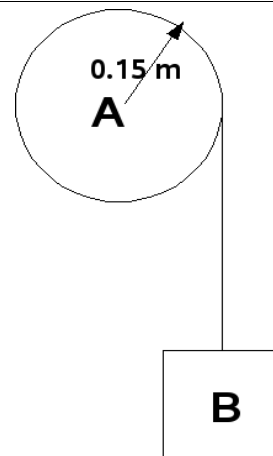
$$t = 2 \text{ seconds}$$

$$\omega = t^3/10 + 0.75t + 6$$

When  $t = 2$ :

$$(2^3)/10 + 0.75(2) + 6 = 36 \text{ rad/s}$$

$$\alpha_A = 3.15 \text{ rad/s}^2$$



## 16-19

$$S_0 = 0 ; S = 6000 \text{ mm}$$

$$\alpha = 6000 \text{ rad/s}^2$$

$$6 \text{ meters on the rope} = 6000/75\pi \text{ revolutions}$$

$$r_A \alpha_A = r_C \alpha_C$$

$$50 \alpha_A = 6000 \times 150$$

$$\alpha_A = 6000 \times 150 / 50 \text{ rad/s}^2$$

$$\theta \text{ when C revolved} = \frac{6000 \times 250\pi}{75\pi} = 12000 \text{ rad}$$

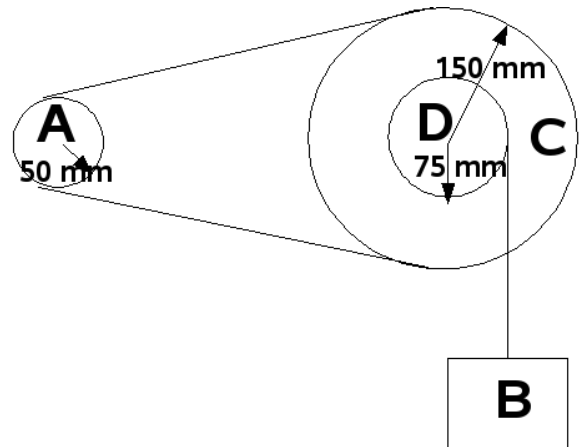
$$12 = \frac{1}{2} \times 6000 \times t^2$$

$$t = \sqrt{12/3000} = 0.063 \text{ rad/s}$$

When C and D have one center

$$\omega_D = 0.063 \text{ rad/s}$$

$$\text{Velocity} = r\omega = 75 \times 0.063 = 4.725 \text{ mm}$$



## 16-23

$$\alpha_A = 4t^3 \text{ rad/s}^2$$

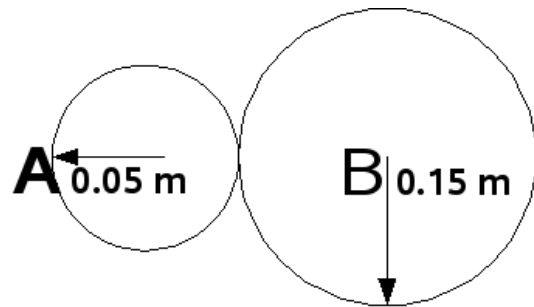
$$\omega_{A0} = 20 \text{ rad/s}$$

$$\omega_A = t^4 + 20 \text{ (By integration)}$$

When  $t = 2$

$$\omega_A = 36 \text{ rad/s}$$

$$\omega_B = 36 \times \frac{0.15}{0.05} = 108 \text{ rad/s}$$



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